In the Claims:

1. A high-temperature cuprate-type superconductor having a primary interaction cluster consisting of:

a central Cu atom;

four nearest Cu atoms;

four second-nearest Cu atoms; and

four third-nearest Cu atoms.

2. The high-temperature cuprate-type superconductor of claim 1, wherein:

the interaction between the central Cu atom and one of the third-nearest Cu atoms is comparable to the interaction between the central Cu atom and one of the nearest Cu atoms.

3. The high-temperature cuprate-type superconductor of claim 1, wherein:

a singlet state, formed from orbital hybridization in clusters containing several atoms, is spatially bounded to dimensions comparable to the size of the primary interaction cluster.

4. The high-temperature cuprate-type superconductor of claim 1, wherein the singlet state has a wavefunction symmetry given by $d_{X^2-y^2}$.

5. The high-temperature cuprate-type superconductor of claim 1, wherein the singlet state remains spatially bounded and retains a sufficient amount of phase coherence so that the singlet state forms a bosonic preformed charge pair during transport through a lattice.

6. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises preformed charge singlet pairs at $T > T_c$.

7. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises preformed charge singlet pairs comprising bosons.

8. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises preformed charge singlet pairs with low binding energies.

9. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises preformed charge singlet pairs with binding energies of less than 100 meV.

10. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises preformed charge singlet pairs that have a short-range attractive potential between pairs.

11. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises an attractive interaction distance between preformed charge pairs of between about 5A and about 100A.

12. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises an attractive interaction distance between preformed charge pairs of approximately 20A.

13. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises a charge pair comprised of two electrons.

14. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises a charge pair comprised of two holes.

15. The high-temperature cuprate-type superconductor of claim 1, wherein the cuprate-type superconductor comprises bosonic preformed charge pairs that become superconducting in a Bose-Einstein condensation (BEC) type transition.

16. The high-temperature cuprate-type superconductor of claim 1 having charge

densities greater than $1x10^{20}/cm^3$.

17. The high temperature cuprate-type superconductor of claim 1 having a singlet state, wherein a singlet state is formed from orbital hybridization in clusters containing several atoms.

18. A high-temperature cuprate-type superconductor which satisfies a basic condition for BEC given by:

$13qP(\delta,T)=0.408(c/a)/n$

and wherein:

q is the average dopant charge per Cu atom in the Cu-O layer in the cluster;

$P(\delta,T)$ is the probability that a charge is residing in the singlet state at temperature T;

δ is the energy gap between the singlet state and the next highest energy level, and the effective binding energy of the preformed charge pair;

c and a are the tetragonal lattice constants of a primitive unit cell; and

n is the number of layers in a primitive unit cell.

19. The high-temperature superconductor of claim 18 which satisfies a second basic condition for BEC given by $13qP(\delta,T) \leq 2$, which arises from the fact that there is only one singlet state per copper oxide layer in a cluster.

20. The high-temperature cuprate-type superconductor of claim 18, wherein a global superconducting transition occurs at a density of preformed pairs where the average distance between the pairs is approximately equal to the short-range attractive interaction distance.

21. The high-temperature cuprate-type superconductor of claim 18, comprising a cuprate-type material having a low z value, wherein z is given by:

$z = 0.408(c/a)/(13nq_m)$

and wherein:

q_m is the dopant charge per Cu atom when the transition temperature T_c is at its maximum value as a function of doping.

22. The high-temperature cuprate-type superconductor of claim 21, wherein the cuprate-type material has a low z value through a combination of decreasing (*c*/*a*) and/or increasing q_m.

23. The high-temperature cuprate-type superconductor of claim 21, wherein the cuprate-type material has a low z value through a decreasing (*c*/*a*) and/or increasing q_m.

24. The high-temperature cuprate-type superconductor of claim 21 having a high q_m value.

25. The high-temperature cuprate-type superconductor of claim 21, wherein $q_m \geq 0.15$.

26. The high-temperature cuprate-type superconductor of claim 21, wherein:
the cuprate-type material has a low z value through increasing the number n of (Cu-O) layers in a unit cell.

27. The high-temperature cuprate-type superconductor of claim 21, wherein:
the cuprate-type material has a low z value through increasing the charge density n_e.

28. The high-temperature cuprate-type superconductor of claim 21, wherein the cuprate-type material has charge densities greater than $1 \times 10^{20}/cm^3$.

29. The high-temperature cuprate-type superconductor of claim 21, wherein the cuprate-type material has a relatively high value of δ_m, where δ_m is the effective binding energy of the preformed charge pair when T_c is at its maximum value as a function of doping.

30. The high-temperature cuprate-type superconductor of claim 21, wherein the cuprate-type material has $\delta_m > 1$meV.

31. The high-temperature cuprate-type superconductor of claim 21 having a relatively high site-hopping and/or superexchange interactions between the atoms in the cluster.

32. The high-temperature cuprate-type superconductor of claim 21 having a relatively high Neel temperature, T_N, in the antiferromagnetic insulating phase.

33. The high-temperature cuprate-type superconductor of claim 21 having a Neel temperature $T_N > 500K$ in the antiferromagnetic insulating phase.

34. The high-temperature cuprate-type superconductor of claim 21 comprising a material that exhibits BEC superconductivity at temperatures higher than BCS type superconducting transitions.

35. The high-temperature cuprate-type superconductor of claim 21 comprising a material that exhibits BEC superconductivity at temperatures in excess of 300K.

36. The high-temperature cuprate-type superconductor of claim 21, wherein the cuprate-type material has a low z value through increasing the size of the cluster by increasing the lattice constant *a*.

37. The high-temperature cuprate-type superconductor of claim 21, wherein the cuprate-type material has a low z value through increasing the size of the cluster by increasing the number of atoms participating in the cluster beyond the third nearest neighbors.

38. A high-temperature superconductor having a singlet state, wherein the singlet state is formed from orbital hybridization in interaction clusters containing several atoms.

39. The high-temperature superconductor of claim 38 having a singlet state that is spatially bounded to dimensions comparable to the size of the cluster.

40. The high-temperature superconductor of claim 38, having a singlet state that remains spatially bounded and retains a sufficient amount of phase coherence so that it forms a bosonic preformed charge pair during transport through the lattice.

41. A high-temperature superconductor having preformed charge singlet pairs at $T > T_c$.

42. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises preformed charge singlet pairs that comprise bosons.

43. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises preformed charge singlet pairs with low binding energies.

44. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises preformed charge singlet pairs with binding energies of less than 100 meV.

45. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises preformed charge singlet pairs that have a short-range attractive interaction between the pairs.

46. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises an attractive interaction distance between preformed charge pairs of between about 5A and about 100A.

47. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises a charge pair comprised of two electrons.

48. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises a charge pair comprised of two holes.

49. The high temperature superconductor of claim 41, wherein the high-temperature superconductor comprises a charge pair comprised of one electron and one hole.

50. A high temperature superconductor wherein a global superconducting transition occurs at a density of preformed pairs where the average distance between the pairs is approximately equal to the attractive interaction distance.

51. The high-temperature superconductor of claim 50, where the boson density, n_b, is given by:

$n_b = \frac{1}{2} n_e P(\delta, T)$

and wherein:

n_e is the charge density;

$P(\delta, T)$ is the probability that a charge is residing in the singlet state at temperature T; and

δ is the energy gap between the singlet state and the next highest energy level, and the effective binding energy of the preformed charge pair.

52. The high-temperature superconductor of claim 51 having charge densities greater than $1 \times 10^{20}/cm^3$.

53. The high-temperature superconductor of claim 51 having charge densities intermediate between the cuprates ($1\text{-}2 \times 10^{21}/cm^3$) and conventional metals ($10^{22}\text{-}10^{23}\ /cm^3$).

54. The high-temperature superconductor of claim 50 having a relatively large interaction cluster.

55. The high-temperature superconductor of claim 50 having a relatively large lattice constant.

56. The high-temperature superconductor of claim 50 having a lattice constant larger

than 3A.

57. The high temperature superconductor of claim 50, having relatively high interaction between the atoms in its cluster.

58. A device containing a high-temperature superconductor according to any of claims 1, 18, 38, 41, or 50.

59. The device of claim 58, wherein said device is capable of executing a function selected from the group consisting of: generating electrical power, transmitting electrical power, conditioning electrical power, storing electrical energy, generating electrical signals, generating electromagnetic signals, transmitting electrical signals, transmitting electromagnetic signals, switching electrical power, switching electromagnetic signals, transporting or conveying people, and transporting or conveying goods or materials.

60. The device of claim 58, wherein said device is selected from the group consisting of: electric motors, electric generators, transmission lines, wires, cables, electromagnets, computers and computing devices, communication devices, telecommunication devices, active and passive components of analog circuits, active and passive components of digital circuits, microelectronic devices, logic switches, interconnection materials and devices, electronic filters, and memory circuits.

61. The device of claim 58, wherein said device is selected from the group consisting of: scientific instruments, magnetometers, medical systems, MRI devices, NMR devices, electro-optical devices, magneto-optical devices, and lasers.

62. A method for making a high-temperature superconductor according to any of claims 1,18, 38, 41, or 50.